The Endocrine Disorder by Smoking Inhalation

Sulin Wang[1], Xiufang Chen[2], Shen Cherng[2]

1. Basic Medical Science Research Center, Zhengzhou University, Zhengzhou, Henan 450052, China
2. Department of Medicine, Henan Xiandai Medical Research Institute, Zhengzhou, Henan 450052, China; cherng@msu.edu

Abstract: The smoking inhalation reduced the secretion levels of blood serum, testosterone (T), luteinizing hormone (LH), and follicle stimulating hormone (FSH) of the rats. Prolactin level was reduced under the long-term regular smoking inhalation for female rats. The histology analysis of the testis of the male rats was performed to exam the degree of lesion by smoking. Conclusively results revealed that smoking inhalation causes the endocrine disorder. It took long time to recover from endocrine disorder if stopped smoking. [Life Science Journal. 2005;2(1): 37-39] (ISSN: 1097-8135).

Keywords: endocrine disorder; smoking; smoking inhalation

1 Introduction

Smoking is one of the important factors to affect the human health. The smoking may cause the organ system acting abnormally. Chemicals in smoking inhalation causing the endocrine disorder of the human body have been discussed for two decades. The main purpose of this report is to confirm the levels of endocrine disorder by smoking.

2 Material and Method

36-male and 36-female Wistar rats were divided into three types of group as smoking inhalation, control and natural recovery group respectively. Each group has 12 rats and the weight of them was between 180 g to 220 g. All the animals were provided by Henan Experimental Animal Center (Zhengzhou, China). Hongxi cigarette, made in Henan Ruzhou Cigarette Manufacture Company, and the home-made inhalation box, sized as 1740 mm × 1100 mm × 1500 mm with two 2 mm × 3 mm air holes on the two vertex of topside diagonal line were used to provide smoking inhalation. The nicotine amount of Hongxi cigarette is 1.1 mg. The amount of tar is 17 mg per 84-mm-long cigarette as well. The experimental test kits of testosterone (T), luteinizing hormone (LH), follicle stimulating hormone (FSH) and prolactin were provided by Tianjin Depu Biomedical Technique Company. The SM-696 γ-measure machine was made in Shanghai Nuclear Research Institute, Rihuan Equipment Manufactory Company. Six rats were kept in one cage. Two cages designed to fit into the smoking inhalation box. Four pieces of cigarette were tightened as a bundle. A piece of bundle cigarettes were hanged and burned for smoking in the cage. Changing the bundle-cigarette every 15 minutes. It was scheduled to burn up 32 pieces of cigarette in 50 minutes, twice a day for first 38 days. And then once a day for another 38 days for 76 days, we sacrificed the animals by coeliac-injection of ketamine for checking the levels of T, LH, FSH and prolactin for female and the visceral coefficients of the testis and epididymis for male. The data were analyzed by SPSS 10.0 program with u test (Ridit analysis), student t test and expressed the results as $x + s$ (standard error). Visceral coefficient is defined as the ratio of the weight of organ to the body. The histology study was followed up by the standard procedures.

3 Results

Table 1 and Table 2 have shown the level of T, LH, FSH and prolactin in control, natural recovery and smoking inhalation group. The natural recover group did not show any significant difference in comparison with the control ($P > 0.05$). Others have shown the significant difference. The data of visceral coefficients of testis and epididymis for male rats ($x \pm s$) presented in Table 3. Figure 1 depicted the normal histology structure of testis for rats control group. Spermatogonium cells, Stertoli cells, primary spermatocytes and secondary spermatocyte all could be seen in seminiferous tubles. Sperms were in tubli recti and Laydig cells were also seen in rete testis. Minor lesions were found in Figure 2. Histoplasmosis and less sperms were depicted for 50% rats in smoking inhalation group. In Figure 3, seminiferous tubles presented to be

thinner than normal, much less primary spermatocytes and secondary spermatocytes were found. Sperm and sperm cells disappeared. However, Spermatogonium cells still could be seen for 25% rats in smoking inhalation group. Necrosis of spermatocyte was seen clearly. In Figure 4, all cells necrosis was seen clearly in serious lesions for 25% rats in smoking inhalation group. For natural recovery group, in comparison with smoking inhalation group, we were not able to find significant difference. All the lesions were very similar ($P>0.05$).

Table 1. In comparison to the level of T and LH for female rats ($x \pm s$)

Type of the group	n	T (n mol/L) level	LH (IU/L) level
Control	12	4.86 ± 2.29	1.74 ± 0.66
Smoking inhalation	12	$2.1 \pm 1.12^{**}$	$1.06 \pm 0.41^{*}$
Natural recovering	12	$2.3 \pm 0.97^{**}$	$1.18 \pm 0.36^{*}$

Note: in comparison with control statistically, $*P<0.05$, $**P<0.01$

Table 2. In comparison to the level of FSH and Prolactin for female rats ($x \pm s$)

Type of the group	n	FSH (IU/L)	Prolactin (μ g/L)
Control	12	1.45 ± 0.34	2.76 ± 1.08
Smoking inhalation	12	$1.02 \pm 0.31^{*}$	3.13 ± 1.16
Natural recovering	12	$1.06 \pm 0.33^{*}$	3.08 ± 1.21

Note: in comparison with control statistically, $*P<0.05$

Table 3. The visceral coefficients of testis and epididymis for male rats ($x \pm s$)

Type of the group	n	Testis (g/kg)	Epididymis (g/kg)
Control	12	9.78 ± 1.29	4.45 ± 0.33
Smoking inhalation	12	$8.59 \pm 0.98^{*}$	$4.05 \pm 0.26^{**}$
Natural recovering	12	$8.66 \pm 0.79^{*}$	$4.10 \pm 0.27^{*}$

Note: in comparison with control statistically, $*P<0.05$, $**P<0.01$

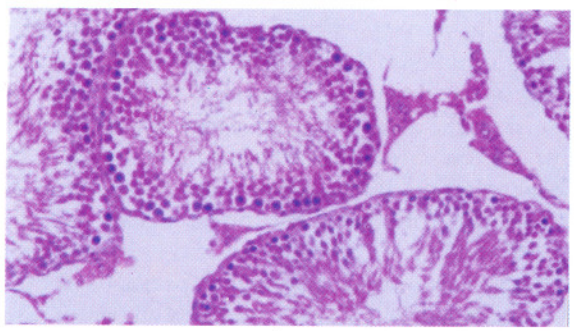

Figure 1. The normal testis histology microscopic picture (HE×400)

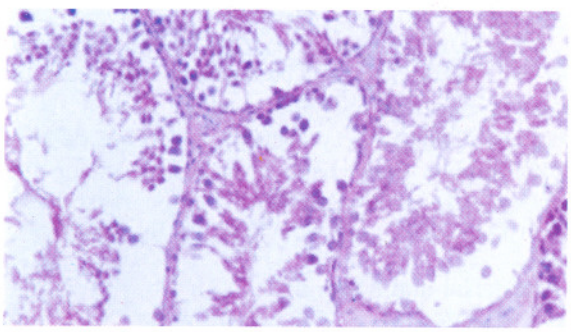

Figure 2. Minor lesions of the testis of the male rat caused by smoking inhalation (HE ×400)

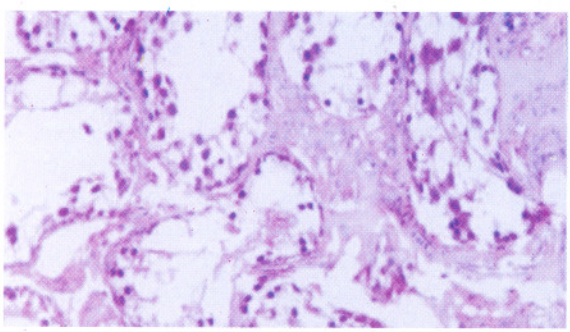

Figure 3. The second degree lesion of the testis of the male rats (HE×200)

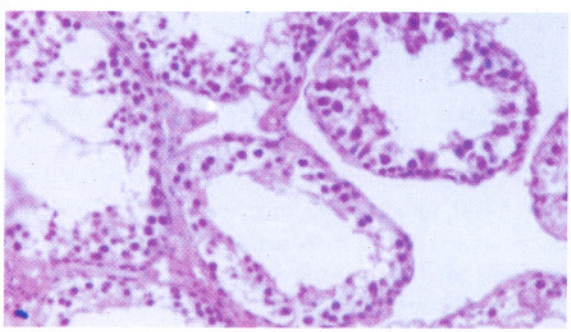

Figure 4. The serious lesion of testis of the male rat under smoking inhalation (HE ×200)

4 Discussion

The effect of the smoking inhalation to human reproductive endocrine, special for the male becomes more and more concern to the most of smokers. The experimental data revealed that the quality and quantity of the sperms being influenced by smoking[2,3]. This report also revealed that the smoking could cause the different degrees of lesion on testis of the male rats, which is consistent to the research results all around the world[4]. The cigarette smoking includes about 400 different chemicals that may affect the human organ[5,6]. The mechanism of the lesion occurred in testis

tissue may be originated by the long term increasing of anti-oxidizes[7] and the level of plasma endothelin-1[8], which may cause the vasoconstriction to insufficiently provide the blood to the organ. This may be the reason that smoking can cause the cell shrinkage of the testis. By Goerre, plasma endothelin-1 is the chemical to cause most vasoconstriction. Plasma endothelin-1 causes vasoconstriction in organs including testis of the male rat. Therefore, the supply of the blood may be insufficient for the function of testis.

5 Conclusion

This report presents the result of decreasing body level T, which is consistence with the research result that Wei did in the year of 2000[9,10]. The synthesis of testosterone is in the endoplasmic reticulum (ER) of interstitial cell and mitochondria. In the mean time, the synthesis of testosterone is also involved hypothalamic-pituitary unit. Zhou[11] suggested HCG may inhibit the secretion of testosterone and was confirmed by our experiments[12]. The smoking may also affect the characteristics of Leydig cells, which indirectly affect the secretion of testosterone and caused the decrease of serum concentration. The analysis of the data from natural recovery group revealed the existence of the mechanism for recovery if smoking is stopped in the long run. However, the detail mechanism is still not clear and the recovery effect was slow in comparison with the damage of the organs. The further research will be focused on the mechanism of the recovering process of the stopped smoking.

Correspondence to:
Shen Cherng
Department of Medicine
Henan Xiandai Medical Research Institute
Zhengzhou, Henan 450052, China
Telephone: 517-349-2362 (Michigan, USA)
Email: cherng@msu.edu

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